Journal of MOLECULAR BIOLOGY

EDITOR-IN-CHIEF
J. C. KENDREW

ASSISTANT EDITOR
S. BRENNER

EDITORIAL BOARD
R. L. Baldwin
M. L. Birnstiel
J. M. Bishop
M. S. Bretscher
C. R. Cantor
L. Caro
J. Davies
W. F. Dove
G. A. Gilbert
W. Gilbert
R. Huber
A. Klug
D. E. Koshland
S. Lowey
M. F. Moody
D. Nathans
D. C. Phillips
P. M. B. Walker
J. C. Wang
S. M. Weissman

VOLUME 103

5 May 1976 to 5 June 1976

ACADEMIC PRESS
London New York San Francisco

Copyright © 1976, by Academic Press Inc. (London) Ltd.

ALL RIGHTS RESERVED

No part of this volume may be reproduced in any form, by photostat, microfilm, or any other means, without written permission from the publishers.

Printed in Great Britain

CONTENTS OF VOLUME 103

NUMBER 1, 5 MAY 1976

FLETTERICK, R. J., SYGUSCH, J., MURRAY, N., MADSEN, N. B. and JOHNSON, L. N., Low-resolution Structure of the Glycogen Phosphorylase *a* Monomer and Comparison with Phosphorylase *b* 1

FINKELSTEIN, A. V. and PTITSYN, O. B., A Theory of Protein Molecule Self-organization. IV. Helical and Irregular Local Structures of Unfolded Protein Chains 15

RICHMOND, T. J. and STEITZ, T. A., Protein–DNA Interaction Investigated by Binding *Escherichia coli lac* Repressor Protein to Poly[d(A·U-HgX)] 25

COLE, R. S., LEVITAN, D. and SINDEN, R. R., Removal of Psoralen Interstrand Cross-links from DNA of *Escherichia coli*: Mechanism and Genetic Control 39

SHERMAN, L. A. and GEFTER, M. L., Studies on the Mechanism of Enzymatic DNA Elongation by *Escherichia coli* DNA Polymerase II 61

SHIH, D. S. and KAESBERG, P., Translation of the RNAs of Brome Mosaic Virus: The Monocistronic Nature of RNA1 and RNA2 77

BANSIL, R., HERZFELD, J. and STANLEY, H. E., Kinetics of Co-operative Ligand Binding in Proteins: The Effects of Organic Phosphates on Hemoglobin Oxygenation 89

Appendix: General Form of the Transition Probability 123

DAEGELEN, P. and BRODY, E., Early Bacteriophage T4 Transcription. A Diffusible Product Controls rIIA and rIIB RNA Synthesis 127

STRAUS, D. S. and STRAUS, L. D'A., Large Overlapping Tandem Genetic Duplications in *Salmonella typhimurium* 143

PAULSON, J. R., LAZAROFF, S. and LAEMMLI, U. K., Head Length Determination in Bacteriophage T4: The Role of the Core Protein P22 . . . 155

SCHMID, M. F. and HERRIOTT, J. R., Structure of Carboxypeptidase B at 2·8 Å Resolution 175

LETTERS TO THE EDITOR

KOGOMA, T., Two Types of Temperature Sensitivity in DNA Replication of an *Escherichia coli dna*B Mutant 191

ROBERTS, R. J., MYERS, P. A., MORRISON, A. and MURRAY, K., A Specific Endonuclease from *Haemophilus haemolyticus*. 199

Number 2, 15 May 1976

Morse, D. E. and Morse, A. N. C., Dual-control of the Trytophan Operon is Mediated by Both Tryptophanyl-tRNA Synthetase and the Repressor . 209

Warshel, A. and Levitt, M., Theoretical Studies of Enzymic Reactions: Dielectric, Electrostatic and Steric Stabilization of the Carbonium Ion in the Reactions of Lysozyme 227

Stewart, M. and McLachlan, A. D., Structure of Magnesium Paracrystals of α-Tropomyosin 251

McLachlan, A. D. and Stewart, M., The 14-fold Periodicity in α-Tropomyosin and the Interaction with Actin 271

Appendix: Fourier Tranform of a Random Sequence Profile . . . 293

Lickfeld, K. G., Menge, B., Hohn, B. and Hohn, T., Morphogenesis of Bacteriophage Lamdba: Electron Microscopy of Thin Sections . . 299

Bertrand, K., Squires, C. and Yanofsky, C., Transcription Termination *in vivo* in the Leader Region of the Tryptophan Operon of *Escherichia coli* 319

Bertrand, K. and Yanofsky, C., Regulation of Transcription Termination in the Leader Region of the Tryptophan Operon of *Escherichia coli* Involves Tryptophan or its Metabolic Product 339

Squires, C., Lee, F., Bertrand, K., Squires, C. L., Bronson, M. J. and Yanofsky, C., Nucleotide Sequence of the 5′ End of Tryptophan Messenger RNA of *Escherichia coli* 351

Lee, F., Squires, C. L., Squires, C. and Yanofsky, C., Termination of Transcription *in vivo* in the *Escherichia coli* Tryptophan Operon Leader Region . 383

Korn, L. J. and Yanofsky, C., Polarity Suppressors Increase Expression of the Wild-type Tryptophan Operon of *Escherichia coli* 395

Platt, T., Squires, C. and Yanofsky, C., Ribosome-protected Regions in the Leader-*trpE* Sequence of *Escherichia coli* Tryptophan Operon Messenger RNA 411

Letters to the Editor

Blaurock, A. E. and Nelander, J. C., Disorder in Nerve Myelin: Analysis of the Diffuse X-ray Scattering 421

Yang, D. S. and Matthews, K. S., Lactose Repressor Protein Reaction with 2-Chloromercuri-4-Nitrophenol 433

NUMBER 3, 25 MAY 1976

MILLMAN, B. M. and BENNETT, P. M., Structure of the Cross-striated Adductor Muscle of the Scallop 439

BIJLENGA, R. K. L., AEBI, U. and KELLENBERGER, E., Properties and Structure of a Gene *24*-controlled T4 Giant Phage 469

GROSJEAN, H., SÖLL, D. G. and CROTHERS, D. M., Studies of the Complex Between Transfer RNAs with Complementary Anticodons. I. Origins of Enhanced Affinity Between Complementary Triplets 499

SCHWARTZ, M., The Adsorption of Coliphage Lambda to its Host: Effect of Variations in the Surface Density of Receptor and in Phage–Receptor Affinity 521

Appendices: 1. Calculation of the Effective Collision Time in the Process of Phage Adsorption 531

2. Effect of Preferred Bi-dimensional Diffusion on Ligand–Membrane interaction. Application to the Problem of Bacteriophage Adsorptions . 533

SOGO, J. M., GREENSTEIN, M. and SKALKA, A., The Circle Mode of Replication of Bacteriophage Lambda: The Role of Covalently Closed Templates and the Formation of Mixed Catenated Dimers 537

SLAVIK, N. S. and HERSHBERGER, C. L., Internal Structural Organization of Chloroplast DNA from *Euglena gracilis* Z 563

TESSMAN, I., TESSMAN, E. S., POLLOCK, T. J., BORRÁS, M.-T., PUGA, A. and BAKER, R., Reinitiation Mutants of Gene *B* of Bacteriophage S13 that Mimic Gene *A* Mutants in Blocking Replicative Form DNA Synthesis . 583

BURKI, H. J., Critical DNA Damage and Mammalian Cell Reproduction . . 599

BUCKINGHAM, M. E., COHEN, A. and GROS, F., Cytoplasmic Distribution of Pulse-labelled Poly(A)-containing RNA, Particularly 26 S RNA, During Myoblast Growth and Differentiation 611

SINGER, B. S. and GOLD, L., A Mutation that Confers Temperature Sensitivity on the Translation of *rIIB* in Bacteriophage T4 627

LETTERS TO THE EDITOR

SPIERER, P. and ZIMMERMANN, R. A., RNA–Protein Interactions in the Ribosome. VIII. Co-operative Interactions in the 50 S Subunit of *Escherichia coli* 647

HAWLEY, S. A. and MACLEOD, R. M., Electrophoretic Separation of Molecular Species Associated with the Thermal Transition of Chymotrypsinogen A 655

Westbrook, E. M., Characterization of a Hexagonal Crystal Form of an Enzyme of Steroid Metabolism, Δ^5-3-Ketosteroid Isomerase: A New Method of Crystal Density Measurement 659

Westbrook, E. M., Sigler, P. B., Berman, H., Glusker, J. P., Bunick, G., Benson, A. and Talalay, P., Characterization of a Monoclinic Crystal Form of an Enzyme of Steroid Metabolism, Δ^5-3-Ketosteroid Isomerase 665

Weiss, B., Terminal Cross-linking of DNA Strands by a Mixture of Exonuclease III of *Escherichia coli* and Polynucleotide Ligase of Bacteriophage T4 669

Ladner, R. C., Air, G. M. and Fogg, J. H., A Correction to the Sequence of the Alpha Chains of Horse Haemoglobin 675

Erratum 679

Number 4, 5 June 1976

Smith, L. H. and Sinsheimer, R. L., The *in vitro* Transcription Units of Bacteriophage ϕX174. I. Characterization of Synthetic Parameters and Measurement of Transcript Molecular Weights 681

Smith, L. H. and Sinsheimer, R. L., The *in vitro* Transcription Units of Bacteriophage ϕX174. II. *In vitro* Initiation Sites of ϕX174 Transcription 699

Smith, L. H. and Sinsheimer, R. L., The *in vitro* Transcription Units of Bacteriophage ϕX174. III. Initiation with Specific 5′ End Oligonucleotides of *in vitro* ϕX174 RNA 711

Bastin, M., Dasgupta, R., Hall, T. C. and Kaesberg, P., Similarity in Structure and Function of the 3′-Terminal Region of the Four Brome Mosaic Viral RNAs 737

Jones, C. R., Kearns, D. R. and Muench, K. H., Nuclear Magnetic Resonance of the Base-pairing Structure of the Native and Denatured Conformers of *Escherichia coli* Transfer RNA^{Trp} 747

Blanquet, S., Dessen, P. and Iwatsubo, M., Antico-operative Binding of Bacterial and Mammalian Initiator $tRNA^{Met}$ to Methionyl-tRNA Synthetase from *Escherichia coli* 765

Crowther, R. A., Finch, J. T. and Pearse, B. M. F., On the Structure of Coated Vesicles 785

Letter to the Editor

Eventoff, W., Tanaka, N. and Rossmann, M. G., Crystalline Bovine Liver Catalase 799

Announcement 803

Index to Volume 103

Actin, interaction with α-tropomyosin; the 14-fold periodicity in α-tropomyosin, 271
Adductor muscle, cross-striated, of the scallop, structure, 439
Adsorption, bacteriophage, and application of the effect of preferred bi-dimensional diffusion on ligand membrane interaction, 533
—, phage, and calculation of the effective collision time, 531
— of coliphage lambda to its host: effect of variations in the surface density of receptor and in phage-receptor affinity, 521
Aebi, U. (see also Bijlenga, R. K. L.), 469
Air, G. M. (see also Ladner, R. C.), 675
Alpha chains of horse haemoglobin, a correction to the sequence, 675
Anticodons, complementary, and studies of the complex between transfer RNAs. I. Origins of enhanced affinity between complementary triplets, 499
Antico-operative binding of bacterial and mammalian initiator $tRNA^{Met}$ to methionyl-tRNA synthetase from *Escherichia coli*, 765

Bacterial and mammalian initiator $tRNA^{Met}$, antico-operative binding to methionyl-tRNA synthetase from *Escherichia coli*, 765
Bacteriophage adsorption and application of the effect of preferred bi-dimensional diffusion on ligand membrane interaction, 533
— — — calculation of the effective collision time, 531
— lambda morphogenesis: electron microscopy of thin sections, 299
— — replication, circle mode: the role of covalently closed templates and the formation of mixed catenated dimers, 537
— ϕX174 *in vitro* transcription units. I. Characterization of synthetic parameters and measurement of transcript molecular weights, 681
— — — — — — —. II. *In vitro* initiation sites of ϕX174 transcription, 699
— — — — — — —: III. Initiation with specific 5′ end oligonucleotides of *in vitro* ϕX174 RNA, 711
— S13, reinitiation mutants of gene *B* that mimic gene *A* mutants in blocking replicative form DNA synthesis, 583
— T4, giant, gene *24*-controlled, properties and structure, 469
— —, head length determination: the role of the core protein P22, 155
— — polynucleotide ligase mixed with exonuclease III of *Escherichia coli*, and the terminal cross-linking of DNA strands, 669
— — *rIIB* translation, temperature sensitivity is conferred by a mutation, 627
— — transcription, early. A diffusible product controls rIIA and rIIB RNA synthesis, 127
Baker, R. (see also Tessman, I.), 583
Bansil, R., Herzfeld, J. & Stanley, H. E., Kinetics of co-operative ligand binding in proteins: the effects of organic phosphates on hemoglobin oxygenation, 89
Base-pairing structure of the native and denatured conformers of *Escherichia coli* $tRNA^{Trp}$, nuclear magnetic resonance study, 747
Bastin, M., Dasgupta, R., Hall, T. C. & Kaesberg, P., Similarity in structure and function of the 3′-terminal region of the four brome mosaic viral RNAs, 737
Bennett, P. M. (see also Millman, B. M.), 439
Benson, A. (see also Westbrook, E. M.), 665
Berman, H. (see also Westbrook, E. M.), 665
Bertrand, K., Squires, C. & Yanofsky, C., Transcription termination *in vivo* in the leader region of the tryptophan operon of *Escherichia coli*, 319
— & Yanofsky, C., Regulation of transcription termination in the leader region of the tryptophan operon of *Escherichia coli* involves tryptophan or its metabolic product, 339
— (see also Squires, C.), 351
Bijlenga, R. K. L., Aebi, U. & Kellenberger, E., Properties and structure of a gene *24*-controlled T4 giant phage, 469
Binding, antico-operative, of bacterial and mammalian initiator $tRNA^{Met}$ to methionyl-tRNA synthetase from *Escherichia coli*, 765
— of *Escherichia coli lac* repressor protein to poly [d(A·U-HgX)] used in investigation of protein–DNA interaction, 25

Blanquet, S., Dessen, P. & Iwatsubo, M., Antico-operative binding of bacterial and mammalian initiator $tRNA^{Met}$ to methionyl-tRNA synthetase from *Escherichia coli*, 765
Blaurock, A. E. & Nelander, J. C., Disorder in nerve myelin: analysis of the diffuse X-ray scattering, 421
Borrás, M.-T. (see also Tessman, I.), 583
Bovine liver catalase, crystalline, 799
Brody, E. (see also Daegelen, P.), 127
Brome mosaic viral RNAs, similarity in structure and function of the 3′-terminal region, 737
— — virus, translation of RNAs: the monocistronic nature of RNA1 and RNA2, 77
Bronson, M. J. (see also Squires, C.), 351
Buckingham, M. E., Cohen, A. & Gros, F., Cytoplasmic distribution of pulse-labelled poly(A)-containing RNA, particularly 26 S RNA, during myoblast growth and differentiation, 611
Bunick, G. (see also Westbrook, E. M.), 665
Burki, H. J., Critical DNA damage and mammalian cell reproduction, 599

Carbonium ion, dielectric, electrostatic and steric stabilization in the reaction of lysozyme; theoretical studies of enzymic reactions, 227
Carboxypeptidase B, structure at 2·8 Å resolution, 175
Catalase, liver, bovine, crystalline, 799
Cell reproduction, mammalian, and critical DNA damage, 599
Chains, alpha, of horse haemoglobin, a correction to the sequence, 675
2-Chloromercuri-4-nitrophenol, reaction with lactose repressor protein, 433
Chloroplast DNA from *Euglena gracilis* Z, internal structural organization, 563
Chymotrypsinogen A thermal transition, electrophoretic separation of associated molecular species, 655
Circle mode of replication of bacteriophage lambda: the role of covalently closed templates and the formation of mixed catenated dimers, 537
Coated vesicle structure, 785
Cohen, A. (see also Buckingham, M. E.), 611
Cole, R. S., Levitan, D. & Sinden, R. R., Removal of psoralen interstrand cross-links from DNA of *Escherichia coli*: mechanism and genetic control, 39
Coliphage lambda, adsorption to its host: effect of variations in the surface density of receptor and in phage-receptor affinity, 521
Collision time, effective, calculation for the process of phage adsorption, 531
Complex between transfer RNAs with complementary anticodons. I. Origins of enhanced affinity between complementary triplets, 499
Correction to the sequence of the alpha chains of horse haemoglobin, 675
Cross-linking, terminal, of DNA strands by a mixture of exonuclease III of *Escherichia coli* and polynucleotide ligase of bacteriophage T4, 669
Cross-links, interstrand, psoralen, removal from DNA of *Escherichia coli*: mechanism and genetic control, 39
Crothers, D. M. (see also Grosjean, H.), 499
Crowther, R. A., Finch, J. T. & Pearse, B. M. F., On the structure of coated vesicles, 785
Crystal form, hexagonal, of an enzyme of steroid metabolism, Δ^5-3-ketosteroid isomerase, characterization: a new method of crystal density measurement, 659
— —, monoclinic, of an enzyme of steroid metabolism, Δ^5-3-ketosteroid isomerase, characterization, 665
Crystalline bovine liver catalase, 799
Cytoplasmic distribution of pulse-labelled poly(A)-containing RNA, particularly 26 S RNA, during myoblast growth and differentiation, 611

Daegelen, P. & Brody, E., Early bacteriophage T4 transcription. A diffusible product controls rIIA and rIIB RNA synthesis, 127
Dasgupta, R. (see also Bastin, M.), 737
Density of crystals, a new method of measurement; characterization of a hexagonal crystal form of an enzyme of steroid metabolism, Δ^5-3-ketosteroid isomerase, 659
dnaB mutant of *Escherichia coli*, two types of temperature sensitivity in DNA replication, 191
DNA, chloroplast, from *Euglena gracilis* Z, internal structural organization, 563
— damage, critical, and mammalian cell reproduction, 599
— elongation, enzymatic, by *Escherichia coli* DNA polymerase II, studies on the mechanism, 61

DNA, of *Escherichia coli*, removal of psoralen interstrand cross-links: mechanism and genetic control, 39
— protein interaction investigated by binding *Escherichia coli lac* repressor protein to poly [d(A·U-HgX)], 25
—, reinitiation mutants of gene *B* of bacteriophage S13 that mimic gene *A* mutants in blocking replicative form DNA synthesis, 583
— replication of an *Escherichia coli dna*B mutant, two types of temperature sensitivity, 191
—, terminal cross-linking of strands by a mixture of exonuclease III of *Escherichia coli* and polynucleotide ligase of bacteriophage T4, 669
Dessen, P. (see also Blanquet, S.), 765
Diffusion, bi-dimensional, preferred, effect on ligand membrane interaction. Application to the problem of bacteriophage adsorption, 533
Dimers, catenated, mixed, their formation and the role of covalently closed templates: the circle mode of replication of bacteriophage lambda, 537
Disorder in nerve myelin: analysis of the diffuse X-ray scattering, 421
Duplications, genetic, tandem, overlapping, large in *Salmonella typhimurium*, 143

Electron microscopy of thin sections; morphogenesis of bacteriophage lambda, 299
Electrophoretic separation of molecular species associated with the thermal transition of chymotrypsinogen A, 655
Elongation, enzymatic, of DNA, by *Escherichia coli* DNA polymerase II, studies on the mechanism, 61
Endonuclease, specific, from *Haemophilus haemolyticus*, 199
Enzymatic DNA elongation by *Escherichia coli* DNA polymerase II, studies on the mechanism, 61
Enzymic reactions, theoretical studies: dielectric, electrostatic and steric stabilization of the carbonium ion in the reaction of lysozyme, 227
Escherichia coli, co-operative RNA–protein interactions in the 50 S ribosomal subunit, 647
— — *dna*B mutant, two types of temperature sensitivity in DNA replication, 191
— — DNA polymerase II, studies on the mechanism of enzymatic DNA elongation, 61
— — — removal of psoralen interstrand cross-links: mechanism and genetic control, 39
— — exonuclease III mixed with polynucleotide ligase of bacteriophage T4, and the terminal cross-linking of DNA strands, 669
— — methionyl-tRNA synthetase, antico-operative binding of bacterial and mammalian initiator $tRNA^{Met}$, 765
— —, nucleotide sequence of the 5′ end of tryptophan mRNA, 351
— —, polarity suppressors increase expression of the wild-type tryptophan operon, 395
— —, regulation of transcription termination in the leader region of the tryptophan operon involves tryptophan or its metabolic product, 339
— —, transcription termination *in vivo* in the leader region of the tryptophan operon, 319
— —, — — — — — — — tryptophan operon leader region, 383
— — $tRNA^{Trp}$, nuclear magnetic resonance of the base-pairing structure of the native and denatured conformers, 747
— — tryptophan operon mRNA, ribosome-protected regions in the leader-*trpE* sequence, 411 *b*, 1
Euglena gracilis Z, internal structural organization of chloroplast DNA, 563
Eventoff, W., Tanaka, N. & Rossmann, M. G., Crystalline bovine liver catalase, 799
Exonuclease III of *Escherichia coli* mixed with polynucleotide ligase of bacteriophage T4, and the terminal cross-linking of DNA strands, 669

Finch, J. T. (see also Crowther, R. A.), 785
Finkelstein, A. V. & Ptitsyn, O. B., A theory of protein molecule self-organization. IV. Helical and irregular local structures of unfolded protein chains, 15
Fletterick, R. J., Sygusch, J., Murray, N., Madsen, N. B. & Johnson, L. N., Low-resolution structure of the glycogen phosphorylase *a* monomer and comparison with phosphorylase *b*, 1
Fogg, J. H. (see also Ladner, R. C.), 675
Fourier transform of a random sequence profile, 293

Gefter, M. L. (see also Sherman, L. A.), 61
Gene *B* reinitiation mutants of bacteriophage S13 that mimic gene *A* mutants in blocking replicative form DNA synthesis, 583
— *24*-controlled T4 giant phage, properties and structure, 469

Genetic control and mechanism of removal of psoralen interstrand cross-links from DNA of *Escherichia coli*, 39
Glusker, J. P. (see also Westbrook, E. M.), 665
Glycogen phosphorylase *a* monomer low-resolution structure, and comparison with phosophorylase *b*, 1
Gold, L. (see also Singer, B. S.), 627
Greenstein, M. (see also Sogo, J. M.), 537
Gros, F. (see also Buckingham, M. E.), 611
Grosjean, H., Söll, D. G. & Crothers, D. M., Studies of the complex between transfer RNAs with complementary anticodons. I. Origins of enhanced affinity between complementary triplets, 499

Haemoglobin, horse, a correction to the sequence of the alpha chains, 675
— oxygenation, the effects of organic phosphates; kinetics of co-operative ligand binding in proteins, 89
Haemophilus haemolyticus, a specific endonuclease, 199
Hall, T. C. (see also Bastin, M.), 737
Hawley, S. A. & Macleod, R. M., Electrophoretic separation of molecular species associated with the thermal transition of chymotrypsinogen A, 655
Head length determination in bacteriophage T4: the role of the core protein P22, 155
Helical and irregular local structures of unfolded protein chains; a theory of protein molecule self-organization, 15
Herriott, J. R. (see also Schmid, M. F.), 175
Hershberger, C. L. (see also Slavik, N. S.), 563
Herzfeld, J. (see also Bansil, R.), 89
Hohn, B. (see also Lickfield, K. G.), 299
Hohn, T. (see also Lickfield, K. G.), 299
Horse haemoglobin, a correction to the sequence of the alpha chains, 675

Initiation sites, *in vitro*, of ϕX174 transcription, 699
Initiation with specific 5′ end oligonucleotides of *in vitro* ϕX174 RNA, 711
Initiator $tRNA^{Met}$, bacterial and mammalian, antico-operative binding to methionyl-tRNA synthetase from *Escherichia coli*, 765
Iwatsubo, M. (see also Blanquet, S.), 765

Johnson, L. N. (see also Fletterick, R. J.), 1
Jones, C. R., Kearns, D. R. & Muench, K. H., Nuclear magnetic resonance of the base-pairing structure of the native and denatured conformers of *Escherichia coli* $tRNA^{Trp}$, 747

Kaesberg, P. (see also Bastin, M.), 737
— (see also Shih, D. S.), 77
Kearns, D. R. (see also Jones, C. R.), 747
Kellenberger, E. (see also Bijlenga, R. K. L.), 469
Δ^5-3-Ketosteroid isomerase, an enzyme of steroid metabolism, characterization of a hexagonal crystal form: a new method of crystal density measurement, 659
— —, an enzyme of steroid metabolism, characterization of a monoclinic crystal form, 665
Kinetics of co-operative ligand binding in proteins: the effects of organic phosphates on hemoglobin oxygenation, 89
Kogoma, T., Two types of temperature sensitivity in DNA replication of an *Escherichia coli dna*B mutant, 191
Korn, L. J. & Yanofsky, C., Polarity suppressors increase expression of the wild-type tryptophan operon of *Escherichia coli*, 395

λ (see also Bacteriophage), 299, 537
— (see also Coliphage), 521
lac repressor protein of *Escherichia coli*, binding to poly[d(A·U-HgX)] used in investigation of protein-DNA interaction, 25
Lactose repressor protein reaction with 2-chloromercuri-4-nitrophenol, 433

Ladner, R. C., Air, G. M. & Fogg, J. H., A correction to the sequence of the alpha chains of horse haemoglobin, 675
Laemmli, U.K. (see also Paulson, J. R.), 155
Lazaroff, S. (see also Paulson, J. R.), 155
Leader region of *Escherichia coli* tryptophan operon, regulation of transcription termination involves tryptophan or its metabolic product, 339
— — — — — — — — transcription termination *in vivo*, 319, 383
— -*trpE* sequence of *Escherichia coli* tryptophan operon mRNA, ribosome-protected regions, 411
Lee, F., Squires, C. L., Squires, C. & Yanofsky, C., Termination of transcription *in vivo* in the *Escherichia coli* tryptophan operon leader region, 383
— (see also Squires, C.), 351
Levitan, D. (see also Cole, R. S.), 39
Levitt, M. (see also Warshel, A.), 227
Lickfield, K. G., Menge, B., Hohn, B. & Hohn, T., Morphogenesis of bacteriophage lambda: electron microscopy of thin sections, 299
Ligand binding, co-operative, in proteins, kinetics: the effects of organic phosphates on hemoglobin oxygenation, 89
— -membrane interaction, effect of preferred bi-dimensional diffusion. Application to the problem of bacteriophage adsorption, 533
Liver catalase, bovine, crystalline, 799
Lysozyme reaction, dielectric, electrostatic and steric stabilization of the carbonium ion; theoretical studies of enzymic reactions, 227

McLachlan, A. D. & Stewart, M., The 14-fold periodicity in α-tropomyosin and the interaction with actin, 271
— (see also Stewart, M.), 251
Macleod, R. M. (see also Hawley, S. A.), 655
Madsen, N. B. (see also Fletterick, R. J.), 1
Magnesium paracrystals of α-tropomyosin, structure, 251
Mammalian and bacterial initiator $tRNA^{Met}$, antico-operative binding to methionyl-tRNA synthetase from *Escherichia coli*, 765
— cell reproduction and critical DNA damage, 599
Matthews, K. S. (see also Yang, D. S.), 433
Menge, B. (see also Lickfield, K. G.), 299
Messenger RNA, *Escherichia coli* tryptophan operon, ribosome-protected regions in the leader-*trpE* sequence, 411
— —, tryptophan, of *Escherichia coli*, nucleotide sequence of the 5′ end, 351
Methionyl-tRNA synthetase from *Escherichia coli*, antico-operative binding of bacterial and mammalian initiator $tRNA^{Met}$, 765
Millman, B. M. & Bennett, P. M., Structure of the cross-striated adductor muscle of the scallop, 439
Molecular weight, transcript, measurement; the *in vitro* transcription units of bacteriophage ϕX174, 681
Morphogenesis of bacteriophage lambda: electron microscopy of thin sections, 299
Morrison, A. (see also Roberts, R. J.), 199
Morse, A. N. C. (see also Morse, D. E.), 209
Morse, D. E. & Morse, A. N. C., Dual-control of the tryptophan operon is mediated by both tryptophanyl-tRNA synthetase and the repressor, 209
Muench, K. H. (see also Jones, C. R.), 747
Murray, K. (see also Roberts, R. J.), 199
Murray, N. (see also Fletterick, R. J.), 1
Muscle, adductor, cross-striated, of the scallop, structure, 439
Mutant, *Escherichia coli dna*B, two types of temperature sensitivity in DNA replication, 191
Mutants, reinitiation, of gene *B* of bacteriophage S13 that mimic gene *A* mutants in blocking replicative form DNA synthesis, 583
Mutation that confers temperature sensitivity on the translation of *rIIB* in bacteriophage T4, 627
Myelin, nerve, disorder: analysis of the diffuse X-ray scattering, 421
Myers, P. A. (see also Roberts, R. J.), 199
Myoblast growth and differentiation and the cytoplasmic distribution of pulse-labelled poly(A)-containing RNA, particularly 26 S RNA, 611

Nelander, J. C. (see also Blaurock, A. E.), 421
Nerve myelin disorder: analysis of the diffuse X-ray scattering, 421
Nuclear magnetic resonance of the base-pairing structure of the native and denatured conformers of *Escherichia coli* $tRNA^{Trp}$, 747
Nucleotide sequence of the 5′ end of tryptophan mRNA of *Escherichia coli*, 351

Operon, tryptophan, dual-control is mediated by both tryptophanyl-tRNA synthetase and the repressor, 209
—, —, mRNA of *Escherichia coli*, ribosome-protected regions in the leader-*trpE* sequence, 411
—, —, of *Escherichia coli*, transcription termination *in vitro* in the leader region, 319, 383
—, —, — — —, termination *in vivo* in the leader region 319
—, —, — — —, — — regulation in the leader region involves tryptophan or its metabolic product, 339
—, —, wild-type, of *Escherichia coli*, expression increased by polarity suppressors, 395
Oxygenation of hemoglobin, the effects of organic phosphates; kinetics of co-operative ligand binding in proteins, 89
ϕX174 (see Bacteriophage), 681, 699, 711

Paracrystals, magnesium, of α-tropomyosin, structure, 251
Paulson, J. R., Lazaroff, S. & Laemmli, U.K., Head length determination in bacteriophage T4: the role of the core protein P22, 155
Pearse, B. M. F. (see also Crowther, R. A.), 785
Periodicity, 14-fold, in α-tropomyosin and the interaction with actin, 271
Phosphates, organic, effects on hemoglobin oxygenation; kinetics of co-operative ligand binding in proteins, 89
Phosphorylase *a* monomer, glycogen, low-resolution structure, and comparison with phosphorylase *b*, 1
Platt, T., Squires, C. & Yanofsky, C., Ribosome-protected regions in the leader-*trpE* sequence of *Escherichia coli* tryptophan operon mRNA, 411
Polarity suppressors increase expression of the wild-type tryptophan operon of *Escherichia coli* 395
Pollock, T. J. (see also Tessman, I.), 583
Poly(A)-containing RNA, pulse-labelled, particularly 26 S RNA, cytoplasmic distribution during myoblast growth and differentiation, 611
Poly[d(A-U-HgX)], binding of *Escherichia coli lac* repressor protein used in investigation of protein–DNA interaction, 25
Polymerase II for *Escherichia coli*, studies on the mechanism of enzymatic DNA elongation, 61
Polynucleotide ligase of bacteriophage T4 mixed with exonuclease III of *Escherichia coli*, and the terminal cross-linking of DNA strands, 669
Protein-DNA interaction investigated by binding *Escherichia coli lac* repressor protein to poly [d(A-U-HgX)], 25
Proteins, kinetics of co-operative ligand binding: the effects of organic phosphates on hemoglobin oxygenation, 89
Protein, lactose repressor, reaction with 2-chloromercuri-4-nitrophenol, 433
— molecule self-organization, theory: helical and irregular local structures of unfolded protein chains, 15
— P22, core, role in head length determination in bacteriophage T4, 155
— -RNA interactions in the ribosome. VIII. Co-operative interactions in the 50 S subunit of *Escherichia coli*, 647
Psoralen interstrand cross-links, removal from DNA of *Escherichia coli*: mechanism and genetic control, 39
Ptitsyn, O. B. (see also Finkelstein, A. V.), 15
Puga, A. (see also Tessman, I.), 583
Pulse-labelled poly(A)-containing RNA, particularly 26 S RNA, cytoplasmic distribution during myoblast growth and differentiation, 611

rIIA and rIIB RNA synthesis controlled by a diffusible product; early bacteriophage T4 transcription, 127
rIIB translation in bacteriophage T4, temperature sensitivity is conferred by a mutation, 627
Receptor surface density and phage-receptor affinity, effect on the adsorption of coliphage lambda to its host, 521

Reinitiation mutants of gene *B* of bacteriophage S13 that mimic gene *A* mutants in blocking replicative form DNA synthesis, 583
Replication, circle mode, of bacteriophage lambda: the role of covalently closed templates and the formation of mixed catenated dimers, 537
—, DNA, of an *Escherichia coli dna*B mutant, two types of temperature sensitivity, 191
Repressor and tryptophanyl-tRNA synthetase both mediate dual-control of the tryptophan operon, 209
— protein, lactose, reaction with 2-chloromercuri-4-nitrophenol, 433
Ribosomal RNA-protein interactions. VIII. Co-operative interactions in the 50 S subunit of *Escherichia coli*, 647
Ribosome-protected regions in the leader-*trpE* sequence of *Escherichia coli* tryptophan operon mRNA, 411
Richmond, T. J. & Steitz, T. A., Protein–DNA interaction investigated by binding *Escherichia coli lac* repressor protein to poly[d(A·U-HgX)], 25
Roberts, R. J., Myers, P. A., Morrison, A. & Murray, K., A specific endonuclease from *Haemophilus haemolyticus*, 199
Rossmann, M. G. (see also Eventoff, W.), 799
RNA, antico-operative binding of bacterial and mammalian initiator $tRNA^{Met}$ to methionyl-tRNA synthetase from *Escherichia coli*, 765
— of brome mosaic virus, similarity in structure and function of the 3′-terminal region, 737
— — — — —, translation: the monocistronic nature of RNA1 and RNA2, 77
—, messenger, *Escherichia coli* tryptophan operon, ribosome-protected regions in the leader-*trpE* sequence, 411
—, —, tryptophan, of *Escherichia coli*, nucleotide sequence of the 5′ end, 351
—, nuclear magnetic resonance of the base-pairing structure of the native and denatured conformers of *Escherichia coli* $tRNA^{Trp}$, 747
— —, ϕX174, *in vitro*, initiation with specific 5′ end oligonucleotides, 711
— –protein interactions in the ribosome. VIII. Co-operative interactions in the 50 S subunit of *Escherichia coli*, 647
—, pulse-labelled poly(A)-containing, particularly 26 S RNA, cytoplasmic distribution during myoblast growth and differentiation, 611
—, rIIA and rIIB, synthesis controlled by a diffusible product; early bacteriophage T4 transcription, 127
RNAs, transfer, with complementary anticodons, studies of the complex between them. I. Origins of enhanced affinity between complementary triplets, 499

S13 (see also Bacteriophage), 583
Salmonella typhimurium, large overlapping tandem genetic duplications, 143
Scallop, structure of the cross-striated adductor muscle, 439
Schmid, M. F. & Herriott, J. R., Structure of carboxypeptidase B at 2·8 Å resolution, 175
Schwartz, M., The adsorption of coliphage lambda to its host: effect of variations in the surface density of receptor and in phage-receptor affinity, 521
Sequence of the alpha chains of horse haemoglobin, a correction, 675
Sequences, 5′ end, of *in vitro* ϕX174 RNA 711
Sequence, *leader-trpE*, of *Escherichia coli* tryptophan operon mRNA, ribosome-protected regions, 411
—, nucleotide, of the 5′ end of tryptophan mRNA of *Escherichia coli*, 351
Sherman, L. A. & Gefter, M. L., Studies on the mechanism of enzymatic DNA elongation by *Escherichia coli* DNA polymerase II, 61
Shih, D. S. & Kaesberg, P., Translation of the RNAs of brome mosaic virus: the monocistronic nature of RNA1 and RNA2, 77
Sigler, P. B. (see also Westbrook, E. M.), 665
Sinden, R. R. (see also Cole, R. S.), 39
Singer, B. S. & Gold, L., A mutation that confers temperature sensitivity on the translation of *rIIB* in bacteriophage T4, 627
Sinsheimer, R. L. (see also Smith, L. H.), 681, 699, 711
Skalka, A. (see also Sogo, J. M.), 537
Slavik, N. S. & Hershberger, C. L., Internal structural organization of chloroplast DNA from *Euglena gracilis* Z, 563
Smith, L. H. & Sinsheimer, R. L., The *in vitro* transcription units of bacteriophage ϕX174. I. Characterization of synthetic parameters and measurement of transcript molecular weights, 681
Smith, L. H. & Sinsheimer, R. L., The *in vitro* transcription units of bacteriophage ϕX174. III. Initiation with specific 5′ end oligonucleotides of *in vitro* ϕX174 RNA, 711

Smith, L. H. & Sinsheimer, R. L. The *in vitro* transcription units of bacteriophage ϕX174. II. *In vitro* initiation sites of ϕX174 transcription, 699
Sogo, J. M., Greenstein, M. & Skalka, A., The circle mode of replication of bacteriophage lambda: the role of covalently closed templates and the formation of mixed catenated dimers, 537
Söll, D. G. (see also Grosjean, H.), 499
Spierer, P. & Zimmermann, R. A., RNA–protein interactions in the ribosome. VIII. Co-operative interactions in the 50 S subunit of *Escherichia coli*, 647
Squires, C., Lee, F., Bertrand, K., Squires, C. L., Bronson, M. J. & Yanofsky, C., Nucleotide sequence of the 5′ end of tryptophan mRNA of *Escherichia coli*, 351
— (see also Bertrand, K.), 319
— (see also Lee, F.), 383
— (see also Platt, T.), 411
Squires, C. L. (see also Lee, F.), 383
— (see also Squires, C.), 351
Stabilization, dielectric, electrostatic and steric, of the carbonium ion in the reaction of lysozyme; theoretical studies of enzymic reactions, 227
Stanley, H. E. (see also Bansil, R.), 89
Steitz, T. A. (see also Richmond, T. J.), 25
Steroid metabolism enzyme, Δ^5-3-ketosteroid isomerase, characterization of a hexagonal crystal form: a new method of crystal density measurement, 659
— — —, — —, — — — monoclinic crystal form, 665
Stewart, M. & McLachlan, A. D., Structure of magnesium paracrystals of α-tropomyosin, 251
— (see also McLachlan, A. D.), 271
Straus, D. S. & Straus, L. D'A., Large overlapping tandem genetic duplications in *Salmonella typhimurium*, 143
Straus, L. D'A. (see also Straus, D. S.), 143
Structural organization, internal, of chloroplast DNA from *Euglena gracilis* Z, 563
Structure, base-pairing, of the native and denatured conformers of *Escherichia coli* $tRNA^{Trp}$, nuclear magnetic resonance study, 747
— of carboxypeptidase B at 2·8 Å resolution, 175
— — coated vesicles, 785
— — the cross-striated adductor muscle of the scallop, 439
— and function, similarity of, for the 3′-terminal region of the four brome mosaic viral RNAs, 737
—, helical and local, irregular, of unfolded protein chains; a theory of protein molecule self-organization, 15
—, low-resolution, of the glycogen phosphorylase *a* monomer and comparison with phosphorylase *b*, 1
— of magnesium paracrystals of α-tropomyosin, 251
— and properties of a gene *24*-controlled T4 giant phage, 469
Suppressors, polarity, increase expression of the wild-type tryptophan operon of *Escherichia coli*, 395
Sygusch, J. (see also Fletterick, R. J.), 1
Synthesis of rIIA and rIIB RNA is controlled by a diffusible product; early bacteriophage T4 transcription, 127

T4 (see also Bacteriophage), 127, 155, 469, 627, 669
Talalay, P. (see also Westbrook, E. M.), 665
Tanaka, N. (see also Eventoff, W.), 799
Tandem genetic duplications, large, overlapping, in *Salmonella typhimurium*, 143
Temperature sensitivity is conferred by a mutation on the translation of *rIIB* in bacteriophage T4, 627
— —, two types in DNA replication of an *Escherichia coli dnaB* mutant, 191
Templates, covalently closed, their role and the formation of mixed catenated dimers: the circle mode of replication of bacteriophage lambda, 537
Terminal cross-linking of DNA strands by a mixture of exonuclease III of *Escherichia coli* and polynucleotide ligase of bacteriophage T4, 669
3′-Terminal region of the four brome mosaic viral RNAs, similarity in structure and function, 737
Tessman, I., Tessman, E. S., Pollock, T. J., Borrás, M.-T., Puga, A. & Baker, R., Reinitiation mutants of gene *B* of bacteriophage S13 that mimic gene *A* mutants in blocking replicative form DNA synthesis, 583
Tessman, E. S. (see also Tessman, I.), 583

Transcription, early, bacteriophage T4. A diffusible product controls rIIA and rIIB RNA synthesis, 127
— termination regulation in the leader region of the tryptophan operon of *Escherichia coli* involves tryptophan or its metabolic product, 339
— — *in vivo* in the *Escherichia coli* tryptophan operon leader region, 383
— — *in vivo* in the leader region of the tryptophan operon of *Escherichia coli*, 319
— —, *in vitro*, of bacteriophage ϕX174. I. Characterization of synthetic parameters and measurement of transcript molecular weights, 681
— —, — —, of bacteriophage ϕX174. II. *In vitro* initiation sites of ϕX174 transcription, 699
— —, — —, III. Initiation with specific 5′ end oligonucleotides of *in vitro* ϕX174 RNA, 711
Transfer RNAs with complementary anticodons, studies of the complex between them. I. Origins of enhanced affinity between complementary triplets, 499
— RNA^{Met}, initiator, bacterial and mammalian, antico-operative binding to methionyl-tRNA synthetase from *Escherichia coli*, 765
— RNA^{Trp} of *Escherichia coli*, nuclear magnetic resonance of the base-pairing structure of the native and denatured conformers, 747
Transition, thermal, of chymotrypsinogen A, electrophoretic separation of associated molecular species, 655
Translation of *rIIB* in bacteriophage T4, temperature sensitivity is conferred by a mutation, 627
— — the RNAs of brome mosaic virus: the monocistronic nature of RNA1 and RNA2, 77
α-Tropomyosin, 14-fold periodicity and the interaction with actin, 271
— - —, structure of magnesium paracrystals, 251
Tryptophan operon, dual-control is mediated by both tryptophanyl-tRNA synthetase and the repressor, 209
— — of *Escherichia coli*, transcription termination *in vitro* in the leader region, 383
— — of *Escherichia coli*, transcription termination *in vivo* in the leader region, 319
— — — — , regulation in the leader region involves tryptophan or its metabolic product, 339
— — mRNA of *Escherichia coli*, nucleotide sequence of the 5′ end, 351
— — — — — —, ribosome-protected regions in the leader-*trpE* sequence, 411
— —, wild-type, of *Escherichia coli*, expression increased by polarity suppressors, 395
Tryptophanyl-tRNA synthetase and the repressor both mediate dual-control of the tryptophan operon, 209

Vesicles, coated, structure, 785
Virus, brome mosaic, translation of RNAs: the monocistronic nature of RNA1 and RNA2, 77
—, similarity in structure and function of the 3′-terminal region of the four brome mosaic viral RNAs, 737

Warshel, A. & Levitt, M., Theoretical studies of enzymic reactions: dielectric, electrostatic and steric stabilization of the carbonium ion in the reaction of lysozyme, 227
Weiss, B., Terminal cross-linking of DNA strands by a mixture of exonuclease III of *Escherichia coli* and polynucleotide ligase of bacteriophage T4, 669
Westbrook E. M., Characterization of a hexagonal crystal form of an enzyme of steroid metabolism, Δ^5-3-ketosteroid isomerase: a new method of crystal density measurement, 659
—, Sigler, P. B., Berman, H., Glusker, J. P., Bunick, G., Benson, A. & Talalay, P., Characterization of a monoclinic crystal form of an enzyme of steroid metabolism, Δ^5-3-ketosteroid isomerase, 665

X-ray scattering, diffuse: analysis indicates disorder in nerve myelin, 421

Yang, D. S. & Matthews, K. S., Lactose repressor protein reaction with 2-chloromercuri-4-nitrophenol, 433
Yanofsky, C. (see also Bertrand, K.), 319, 339
— (see also Korn, L. J.), 395
— (see also Lee, F.), 383
— (see also Platt, T.), 411
— (see also Squires, C.), 351

Zimmermann, R. A. (see also Spierer, P.), 647